

Wound Healing

The Effects of Topical Antimicrobial Agents

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• The effect of four commonly used topical antimicrobial agents on the rate of reepithelialization of clean wounds was evaluated in white domestic pigs. Neosporin Ointment was found to significantly increase the rate of reepithelialization by 25%, while Furacin significantly retarded the healing rate by 24%. Pharmadine, a preparation containing povidone-iodine, did not affect the rate of healing. Both Silvadene and its vehicle significantly increased the rate of reepithelialization by

(Burroughs Wellcome, Research Triangle Park, NC), Pharmadine (Sherwood Pharmaceutical Co, Mahwah, NJ), Furacin (Norwich-Eaton Pharmaceuticals, Norwich, NY), and Silvadene cream (Marion Labs, Kansas City, Mo). The agents were applied separately to multiple wounds on white domestic pigs. When statistically significant differences were found between an active agent and the

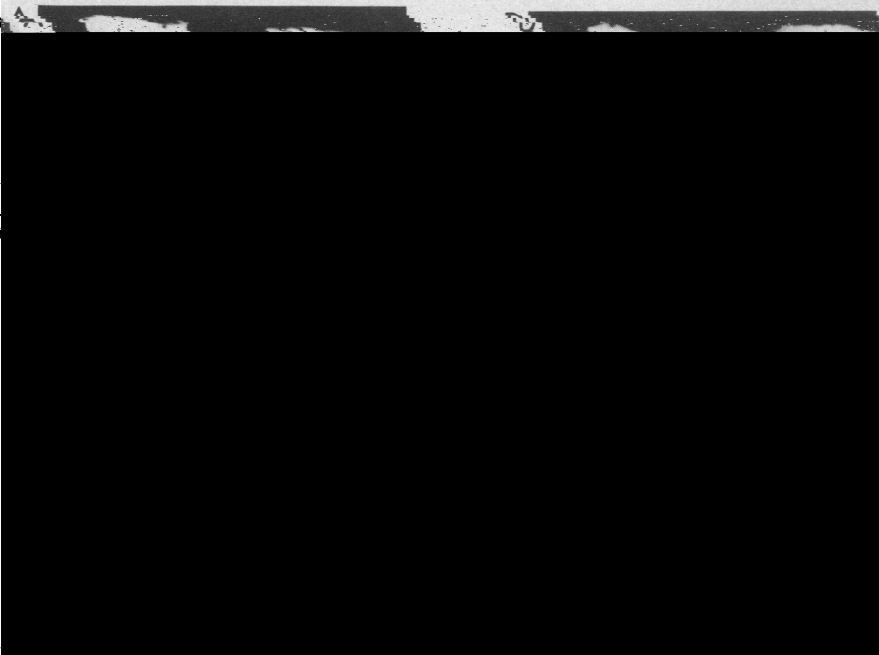
study, and they were housed individually in bins. Five animals received Neosporin Ointment and its vehicle and four animals were treated with each of the other agents tested and their vehicles.

Sampling and Direct Evaluation

On days 2 through 7 following the initial wounding on day 0, five to eight wounds were removed from each group with a Castroviejo dermatome. The dermatome was equipped with a 22-mm blade and set

28% and 21%, respectively. The effects of these agents cannot be explained on the basis of their antimicrobial activity.
(*Arch Dermatol* 115:1311-1314, 1979)

Topical antimicrobial agents have been widely used by dermatologists, surgeons, and family practitioners to prevent bacterial contamination of wounds. There is a wealth of information concerning the antibacterial efficacy of topical agents.¹⁻⁴ However, there are few published data concern-



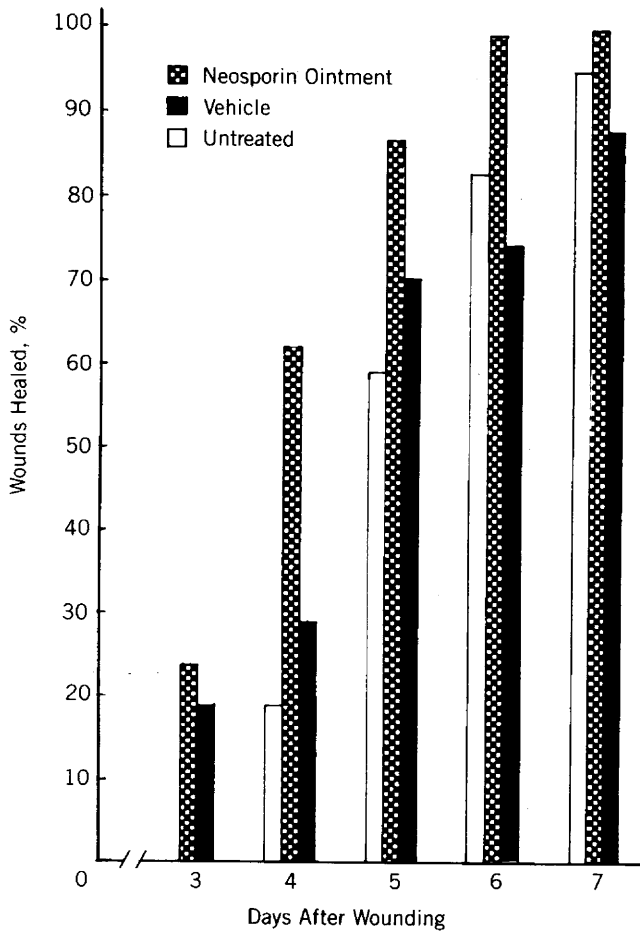


Fig 2.—Effect of Neosporin Ointment, vehicle, and control on wound healing.

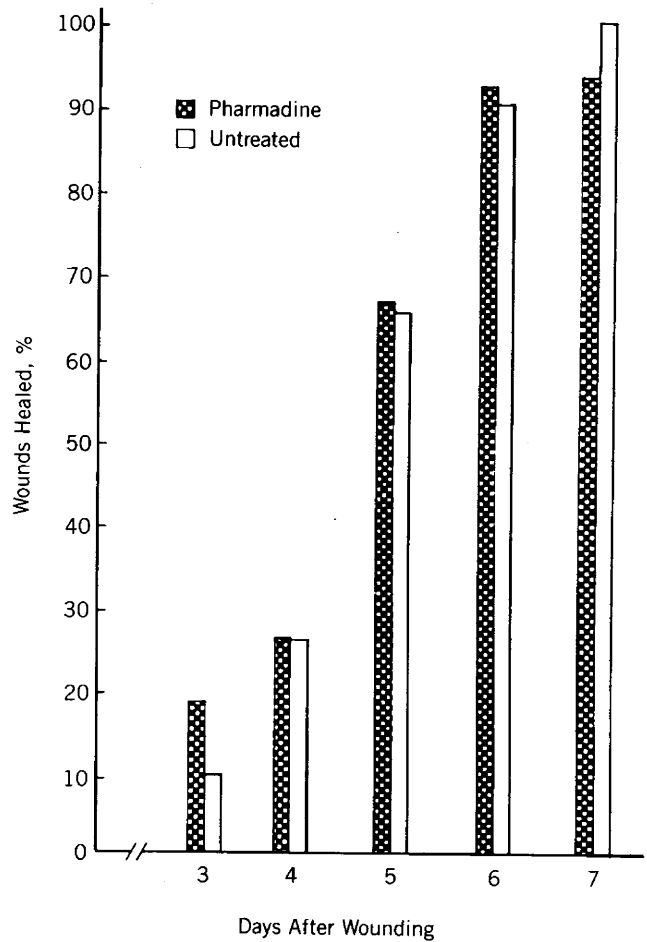


Fig 3.—Effect of Pharmadine and control on wound healing.

Table 1.—Effect of Agents and Vehicles on Healing*

Agent	Day					
	2	3	4	5	6	7
Neosporin group						
Untreated	0/17 (0)	0/27 (0)	5/27 (19)	19/32 (59)	25/30 (83)	20/21 (95)
Neosporin Ointment	0/19 (0)	5/21 (24)†	16/26 (62)‡§	26/30 (87)	26/26 (100)	19/19 (100)
Vehicle	0/15 (0)	5/27 (19)	8/28 (29)	21/30 (70)	20/27 (74)	22/25 (88)
Pharmadine group						
Untreated	...	2/20 (10)	5/19 (26)	17/26 (65)	18/20 (90)	13/13 (100)
Pharmadine	...	4/21 (19)	6/27 (27)	19/29 (66)	22/24 (92)	14/15 (93)
Furacin group						
Untreated	0/15 (0)	1/32 (3)	10/36 (28)	33/48 (69)	43/47 (91)	12/12 (100)
Furacin	0/14 (0)	0/21 (0)	1/27 (4)	2/34 (6)†	17/32 (53)†	8/10 (80)
Vehicle	1/27 (4)	1/23 (4)	2/23 (9)	18/30 (60)	27/30 (90)	10/13 (77)
Silvadene group						
Untreated	0/59 (0)	4/71 (6)	35/86 (41)	44/77 (57)
Silvadene	0/15 (0)	14/29 (48)†	25/28 (89)†	21/21 (100)
Vehicle	1/61 (2)	23/81 (28)†	78/93 (84)†	83/90 (92)

Table 2.—Comparative Rates of Healing With Agents and Vehicles Tested

Agent	HT ₅₀ , Days*	Relative Rate of Healing Compared With Control, %
Neosporin group		
Untreated	4.8	0
Neosporin Ointment	3.6	+25
Vehicle	4.6	+5
Pharmadine group		
Untreated	4.6	0
Pharmadine	4.55	+1
Furacin group		
Untreated	4.6	0
Furacin	6.0	-24
Vehicle	4.8	-9
Silvadene group		
Untreated	4.3	0
Silvadene	3.1	+25
Vehicle	3.4	+21

*HT₅₀ is the time needed for 50% of the wounds to heal.

*Values are expressed as number of specimens healed/total number of specimens tested.

Numbers in parentheses are percent healed.

†P < .05 compared with untreated.

‡P < .01 compared with untreated.

§P < .05 compared with vehicle.

†P < .001 compared with untreated.

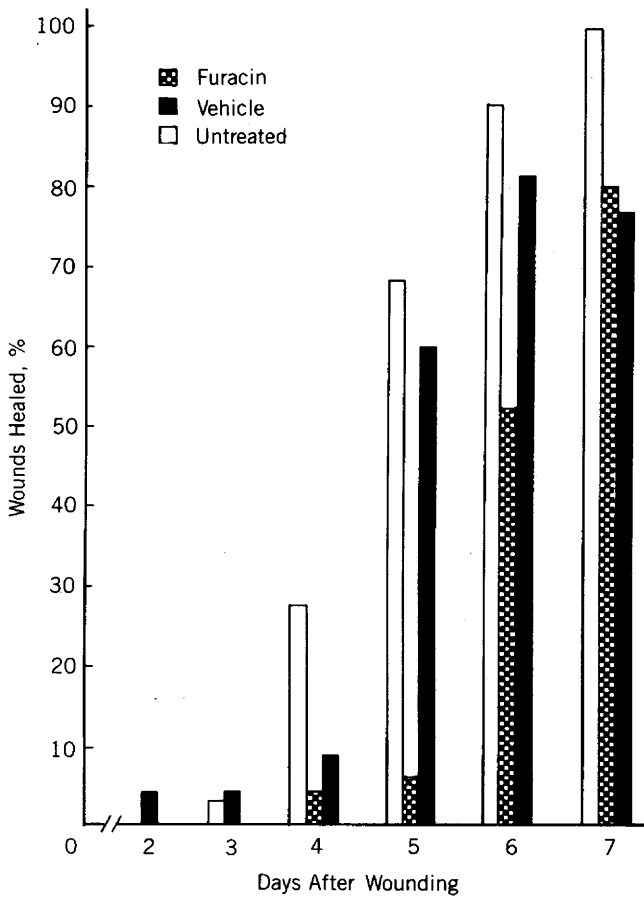


Fig 4.—Effect of Furacin, vehicle, and control on wound healing.

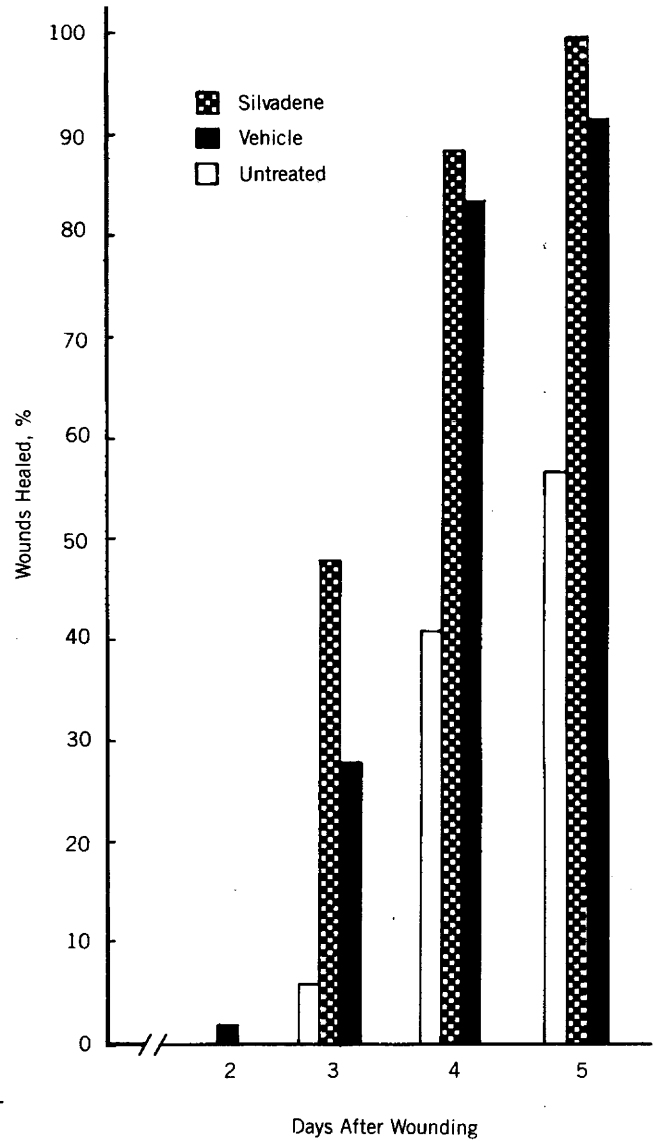


Fig 5.—Effect of Silvadene, vehicle, and control on wound healing.

crusts adhere to the dermal portion of the specimen and leave a defect unless epidermis is present beneath the crust

from curves generated by probit analysis of the data presented in Table 1.

topical agents can cause tissue toxicity, which might lead to a delay in

Treatment

The wounds on each experimental ani-

Table 2.

COMMENT

The rate of reepithelialization of a wound can be altered by changes in

polymyxin B sulfate, and bacitracin zinc, in a petrolatum base. This agent covers a wide spectrum of antibacterial activity including most Gram-positive and Gram-negative bacteria found in human and pig skin. We found that the active agent promoted healing by 95% compared with the

base were significantly faster than the untreated control. There was no significant difference between the active agent and its vehicle.

Although we have demonstrated that topical antimicrobial agents can alter the rate of reepithelialization, their mechanisms of action are not

it would appear worthwhile to evaluate the remainder of the commonly used topical agents that were not examined in this study. An understanding of these agents' mechanisms of action could conceivably lead to the development of new agents that might promote healing while identi-